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PRINCIPAL INVESTIGATOR: Guy Thompson

CONTRACTING ORGANIZATION: Southeast Regional Medical Command
Fort Gordon, GA 30905-5650

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Table of Contents

MTF Computerized Decision Support For Chemical Hazard Emergencies

Abstract

None

Final Results

The Center for Total Access contracted with Care Path Informatics, Inc. to design and develop a computerized decision support software tool to implement medical treatment guidelines for chemical agents including:

1. Nerve Agents
2. Phosgene Gas
3. Mustard Gas
4. Lewisite
5. Chlorine Gas

The software application will provide decision support to emergency medical personnel, including first responders that may be dispatched to a potential disaster or terrorist attack site.

Care Path Informatics provided the Center for Total Access (CTA) with a design development report on December 29, 2003. After undergoing a thorough review process the final design development report was accepted and the contractor given the approval to proceed.

Care Path Informatics delivered the software for testing and evaluation on July 29, 2004. The initial installation of the software revealed the following problems:

1. While following the instructions provided several links did not work.
2. Installation instructions provided were based on Tomcat 5.0.16 and Tomcat 5.0.25 was provided to the CTA.
3. References were made during the verification process to files that did not exist.
4. Verification was achieved through Tomcat but no verification could be made by IIS.
5. Installation instructions were not clear and did not provided for instruction as to how to accommodate differences between the infrastructure used by the military versus the infrastructure used by the vendor.

Care Path Informatics revised the installation instructions and made changes to the software application which was again reviewed by CTA personnel. With minor changes by CTA information technology personnel and telephone assistance from the contractor, the application was successfully loaded.

The application did not meet the requirement as stated in the contract and the statement of work for being fully functional including: providing the government with the ability to execute the software applications on government computer systems (servers and workstations); providing the government with the ability to load data into the software programs; and providing the government with the ability to manipulate such data. Although the contractor was more than willing to install the software application, the requirement was for an application that could be installed by government information technology personnel.

Deliverable

The major deliverable was the Design Development Report supplied by the contractor. After review and acceptance of the Design Development Report the contractor was to begin designing the software application.

The application was designed around the format of the Field Medical Card (FMC). The Field Medical Card is a two-page form (front and back) that is currently in use by the U.S. Army for providing care and injury tracking for military personnel. The HAZMAT application used this design approach to simplify training and use as the layout and look of the FMC are established and currently being utilized by military healthcare providers. Although the HAZMAT application has specific medical requirements that go beyond the FMC those requirements have been built in to the application although they are not found on the FMC Card.

The application has been designed primarily for use inside the Support Zone. This application was designed for use by military personnel treating mass casualty victims. First responders upon arrival at the scene of a major disaster or accident/incident site will be primarily concerned with assessing the situation and making a determination on whether a chemical or biological agent is involved.

The application has been designed to utilize traditional menu-driven processes. The application will be operated on Toshiba Tablet PCs thereby providing additional space as the application will be loaded on a landscape screen surface. The use of Tablet PCs will support ease of navigation for the user to be able to access various steps in the application to assist in the rapid processing of victims.

The application was designed around the CDC HAZMAT protocols to provide a basic victim medical treatment care process and to create an electronic medical record of the process, thereby creating an electronic medical record that can be transmitted electronically with the victim by electronic media. The application design was built around a store and forward approach that collects data locally and depending upon the

victim care and treatment process be transmitted and synchronized with other data repositories.

The application will contain the following data collection fields:

1. Name
2. Social Security Number
3. Date of Birth
4. Allergies
5. Patient Classification (Active Duty, Reserve, Civilian, Contractor, Enemy Prisoner of War, Indigenous Population)
6. Rank
7. Pay Grade
8. Branch of Service
9. Disposition
10. Health History
11. Immunizations
12. Patient Encounter
13. Subjective and Objective
14. Chief Complaint
15. Vital Signs
16. Height
17. Weight
18. Gender

The application has been designed to provide a simple checklist for each of the medical evaluation steps. The core medical evaluation steps will further enhance the application for use at an accident/incident site whether during victim transport or an emergency department setting.

The application was designed with a login feature that requires the user to enter a User ID and Password upon acceptance of the password the application will launch general navigation options as follows:

1. Situational Awareness Report
2. HAZMAT Treatment
3. EXIT

After completing the Situational Awareness Report/Checklist the data will be posted onto the database and the application will then return to the Main Menu. From the Main Menu the user will be given the option to register a victim. Victim Registration allows the user to identify the victim as a new victim or unknown. If the identify of the victim is unknown the application will assign John Doe or Jane Doe along with an automated tracking number. The victim registration screen will be permanently displayed at the top of the screen to allow for the addition of multiple victims.

After the victim information is submitted the user can navigate through the application and can either begin victim assessment or go directly to protocols. The application is designed with a victim assessment section that will display the chief complaint, summary, observations, and recommended treatment protocol and medical orders. The application will allow the user to override protocol treatment recommendations. If the user does not override protocol treatment recommendations the application will provide the user with a selected treatment protocol. The application will then allow the user to enter information about the disposition of the victim. The application will also allow the user to prepare a follow-up examination utilizing Page 2 of the FMC.

Problems Encountered

The CTA wanted an auto-install software application that could be easily installed by government information technology personnel. Care Path Informatics wanted to install the application on government-owned servers as the software was designed to operate through commercial enterprise server applications. In the initial design development report it was clearly stated in the review process that the CTA was looking for an application that could be easily installed without the vendor using government information technology personnel.

Care Path Informatics provided the CTA with detailed installation instructions as per the contract. The CTA information technology personnel faced numerous problems trying to load the software application.

Care Path Informatics wanted to establish a satellite office on the government site and requested that the government furnish property not agreed upon in the initial contract.

Initially, the contractor focused the design of the application on civilian hospital emergency room use rather than on military first responders as the statement of work had outlined.

The contractor objected to the use of the Microsoft Operating System (OS) stating that the operating system was not the most secure platform and vulnerable to viruses and worm attacks. Care Path Informatics proposed Linux as the operating system that should be used for the HAZMAT application. The contractor objected to the use of the Windows Operating System due to Disaster Recovery issues. The contractor was informed that security and maintenance services would be provided by government information technology personnel and that Linux is not part of the existing architecture.

AMEDD-Wide Adoption

This software application could prove to be an invaluable tool for first responders providing medical treatment guidelines for chemical agents. The application will also provide decision support to emergency medical personnel dispatched to a potential disaster or accident site. The software application can be deployed throughout the AMEDD to provide the United States military with decision support job aids to provide timely, appropriate treatment at the scene of a disaster incident.

Next Steps

After the design development report was approved by the government and throughout the application building process several improvements were noted that could enhance the current software application.

An external reference/process checklist HAZMAT documents could be integrated into the application. Incident Command System documents could be added to the application, the body of these documents comprehensively defines the entire federal ICS process. The HAZMAT forms server technology could integrate and automate this entire process. The Special Operations Forces Medical Handbook could likewise be referenced or specific reference material could be added to the application. The Medical Management of Chemical Casualties or the Emergency Response Guidebook could be electronically linked by protocol to provide a quick and ready reference.

The addition of human figure automation could be added to the application which would display a drawing of the front of a human figure. One approach would be to provide the user with the ability to touch that portion of the human body impacted by the injury and then activate that body part thereby relating the decision to the affected body part. Another approach would be to have that portion of the figure highlighted when an observation related to that body part is selected.

The integration of several federal forms into the HAZMAT Application that are used as part of the emergency department triage and treatment process utilized at military hospitals. This will allow the HAZMAT application to link the incident site to the Emergency Department through transmission of the generated electronic medical record. A review of emergency department forms and patient processing steps will need to be reviewed in order for these forms to be fully integrated into a comprehensive continuum of care. The application will then be able to automate the pre-filling and electronic transcription of the field medical records using a forms server application thereby providing these forms to the Emergency Department as part of the daily processing of patients.

The HAZMAT application can be expanded from the Support Zone to the Decontamination Zone or Hot Zone with the use of portable printers that are used to complete field triage cards electronically. This portable printing process could produce a physical tag that could be attached to the victim.

It would be beneficial to be able to test the technology in either training events or exercises to see if the technology is capable of meeting the needs of the user without being a hindrance.

Conclusions

Federal statutes require all hospitals, including military medical treatment facilities (MTFs) to plan for treating persons exposed to hazardous materials (HAZMAT) and the protection of hospital employees. More than two thousand (2,000) chemicals produced in the United States are considered hazardous, with over four (4) billion tons transported yearly by surface, air, or water routes. The CTA assisted with the development, evaluation, and validation of an automated decision support tool for first responders. This prototype support tool utilizing Tablet PCs and a contractor developed software application will allow first responders to collect and provide the necessary information for victim evaluation and assessment. The technology developed has been designed to support the user regardless of whether the support tool is connected to a remote server or not. The entire application and related database reside on the PC tablet. Synchronization and data sharing can occur when a network link is established or a portable storage device is connected to an authenticated network server.

Although this support tool has been evaluated and validated the support tool has never been tested in the field. The question remains is this an appropriate use of technology, will it have a negative impact on the primary mission of first responders? Would technology be better served by not having an application that requires the user to input patient information? Would a handheld device that provided reference material be more beneficial to the user?

After surveying military first responders the results showed that the majority felt that an automated system would be far more beneficial and would improve accuracy and felt that they could spend more time assisting the patient than with the current system of filling out forms.